

FUNCTIONAL OUTCOME OF PATIENTS WHO UNDERWENT SINGLE STAGE BILATERAL ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

PAUL K JOSE¹, JOHN T JOHN², JOICE VARGHESE M J³, DIVYA G⁴ AND RONCY SAVIO KURIVILLA⁴

¹Junior Consultant, Lourdes Hospital, Kochi

²Senior Consultant, Lourdes Hospital, Kochi

³Junior Consultant, Lourdes Hospital, Kochi

⁴DNB Trainee Ortho, Lourdes Hospital, Kochi

ARTICLE INFO

KEYWORDS

single stage
bilateral reconstruction
ACL
anterior cruciate

CORRESPONDENCE

paulkjose@yahoo.com

AVAILABLE ONLINE AT

<http://www.kjoonline.org/>

QUICK RESPONSE CODE



ABSTRACT

Purpose: The ideal treatment for patients presenting with bilateral anterior cruciate ligament (ACL) deficiency remains controversial. The purpose was to evaluate cost and functional results after one-stage bilateral ACL reconstruction using hamstring tendon autograft.

Methods: This prospective study evaluated the mid-term functional outcome of 7 patients (14 knees) who had undergone one-stage bilateral ACL reconstruction.

Results: The median length of hospital stay was 4 (3–5) days. The duration of rehabilitation process in patients with bilateral ACL reconstruction was 6–8 weeks. The mean Lysholm score was 93 (90–95), IKDC score 78.7 (74.7–82.75), and Tegner activity score level 5. The median time to return to full-time work and to full sports was 9 weeks and 8 months respectively. 6 patients (85.7%) in the study group returned to their pre-injury level of activity.

Conclusions: Mid-term clinical results suggested that one-stage bilateral ACL reconstruction using hamstring tendon autograft is clinically effective. For patients presenting with bilateral ACL-deficient knees, one-stage bilateral ACL reconstruction is reproducible, cost effective and does not compromise functional results.

CITE THIS PAPER AS: PAUL K JOSE *et al.* Functional Outcome of Patients Who Underwent Single Stage Bilateral Anterior Cruciate Ligament Reconstruction. *Kerala Journal of Orthopaedics* 2016;29(1-2):5-9.

INTRODUCTION

Anterior cruciate ligament (ACL) rupture is the most common serious injury of the knee. Among patients presenting with ACL-deficient knees, the incidence of bilaterality is reported to be between 2 and 4%^{1,14}. A single mechanism of injury rarely causes simultaneous bilateral ACL tear. Usually unilateral injury of the knee has occurred and later on during further sports activity or trauma, the contra-lateral knee injury has taken place.

Several risk factors have been evaluated for tearing the ACL. The highest incidence is in individuals 15–25 years old who participate in pivoting sports. Around seventy percent of ACL injuries occur in noncontact situations. The risk factors for non-contact ACL injuries fall into four distinct categories: environmental, anatomic, hormonal, and biomechanical⁴. Inadequate or compromised conditioning, experience, muscle recruitment patterns⁵, and proprioception¹⁰ have been described as partially controllable,



trainable characteristics⁹. It has also been suggested that an increased posterior tibial slope and narrow notch width index increase the risk of ACL injury¹³. Familial predisposition could be an associated factor for the ACL tear³. There is a higher incidence of ACL injury rates in women than in men participating in the same sports⁶. With the growing participation of women in athletics and the debilitating nature of ACL injuries, a better understanding of mechanisms of injury in women sustaining ACL injuries is essential. There are many studies which strongly support noncontact mechanisms for ACL tears in women. Speculation on the possible aetiology of ACL injuries in women has centred on anatomic differences, joint laxity, hormones, and training techniques.

ACL reconstruction is a common procedure that usually allows predictable and timely return to function for the patient. The goals of ACL reconstructions are to decrease symptoms, improve function, and return patients to their pre-injury level of activity. When ACL reconstruction is indicated for both knees, surgeons have the choice of performing staged or simultaneous procedures. A review of the literature revealed just a few previous reports on the results of one-stage bilateral ACL reconstruction^{7,8,11,16}.

The purpose of this prospective study was to present our experience and clinical outcome after one-stage bilateral ACL reconstruction.

MATERIALS AND METHODS

From 2010 to 2015, 646 primary ACL reconstructions were performed by the senior consultant at our institution. The indication for operation was symptomatic ACL-deficient knee in patients who desired to return to pre-injury level of activity. During this period, 7 patients (14 knees) underwent one-stage bilateral ACL reconstructions. Data was collected prospectively for all patients undergoing one-stage bilateral ACL reconstruction. All patients signed an informed consent form. This group included seven men with a median age of 30 (27–36) years who had symptomatic instability in both knees because of bilateral ACL tears. All of them had bilateral chronic ACL deficient knees, meaning that they had experienced at least one additional giving-way episode of the knee after the initial injury. The median time from initial injury to surgery was 24 (11–35) months. In all patients, a unilateral injury of the knee had occurred and later on during further sports activity contralateral knee injury had taken place.

All patients in both groups underwent a period of preoperative rehabilitation to eliminate effusion, regain full motion, and develop good leg control and a normal gait pattern before surgery. The patients were also

informed about the operation and the post-operative rehabilitation and its goals.

The operating room set-up included the use of two exclusion arthroscopy drapes, one-camera stack system, and a single set of reconstruction instruments to allow one-stage bilateral surgery by one surgical team. Both knees were prepared and draped separately. An arthroscopy was performed on the first knee to evaluate and treat any meniscal tears following with ACL reconstruction, after which the tourniquet was released, and the knee was wrapped with an elastic bandage. Then, an arthroscopy and ACL reconstruction were performed on the other leg. The choice of graft was based on the standard technique performed by the senior surgeon, which was quadrupled semitendinosus graft.

All patients underwent the same post-operative rehabilitation programme¹². First 2–3 weeks, full weight bearing without use of crutches was recommended 30 degree of knee flexion was allowed in the first week and gradually increased to 120 degree over a period of 6 weeks. Patients were advised to wear braces while weight bearing during this period. Proprioceptive exercises were started from the very first day of rehabilitation. The post operative rehabilitation was concluded once the knee achieved full ROM, not swollen and after they were comfortable with their day to day activities (9 weeks). The patients whose job activities included light functional activities could at that time return to work, while sports active patients began with the sports rehabilitation programme.

Patients returned for regular follow-up visits at 2 and 6 weeks and 3 and 6 months after surgery. For research purposes and mid-term follow-up data, patients were asked to return for evaluation every year after surgery. At 1 year follow up patients were asked to fill up the Lyshom, IKDC, and Tegner knee scoring questionnaire. An additional subjective questionnaire was used to determine when patients returned to full-time work, to low-level sports activities, and to full sports activity. At final follow-up, clinical ligament testing by means of the Lachman test, anterior drawer test, and pivot-shift test, with side-to-side differences recorded. Preoperative total AP laxity of the involved knee has been compared with post-operative total AP laxity measured at follow-ups. Intraoperative and post-operative complications such as wound complications, graft failures, arthrofibrosis, and unexpected inpatient stay were also tabulated.

RESULTS

Mid-term follow-up (average 12 months) after surgery was obtained for all 7 patients (14 knees). The Lyshom score, IKDC score, and Tegner activity score were calculated at final follow up and compared with pre

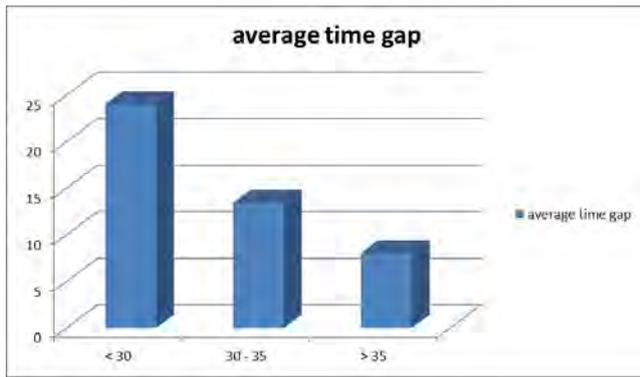


FIGURE 1. In our study, the time gap between the two injuries was found to be significantly lower in older patients compared to younger patients.

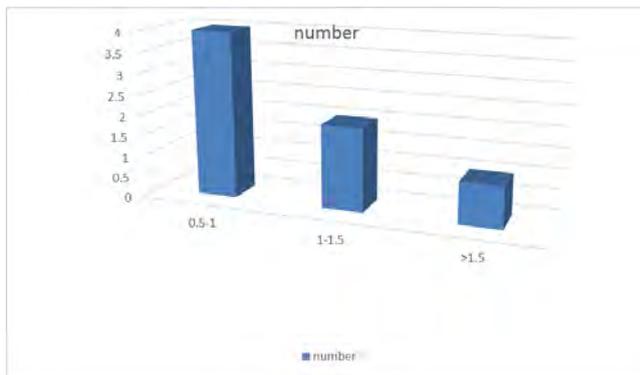


FIGURE 2. Maximum number of patients (4) in our study sustained their second injury within a period of 6–12 months.

surgery scores. The median length of hospital stay was 4 (3–5) days. The duration of rehabilitation process in patients with bilateral ACL reconstruction was 6–8 weeks. The mean Lysholm score was 93 (90–95), IKDC score 78.7 (74.7–82.75), and Tegner activity score level 5. The median time to return to full-time work and to full sports was 9 weeks and 8 months respectively. 6 patients (85.7%) in the study group returned to their pre-injury level of activity.

On final follow up, no patients had ACL laxity as evidenced by a negative anterior drawer, lachman and pivot shift test.

DISCUSSION

The most important finding of the present study is that simultaneous bilateral ACL reconstruction is a clinical and cost effective treatment for patients presenting with symptomatic bilateral ACL deficiency. None of the patients in this study had suffered any serious complication. Despite the otherwise abundant literature regarding ACL reconstruction there is very

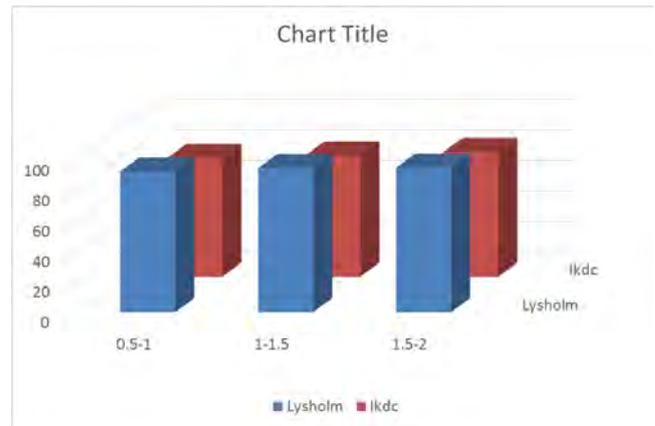


FIGURE 3. Time gap between the two injuries and the Lysholm and IKDC scores in final follow up did not show any significant correlation.

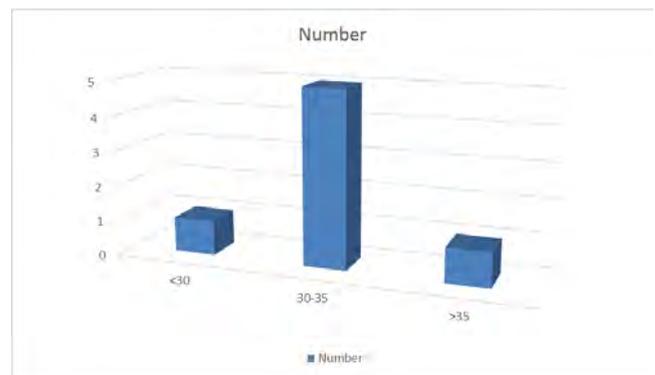


FIGURE 4. Maximum number of patients (5) in our study belonged to 30–35 age group.



FIGURE 5. Age-wise return to work time.

little information regarding strategies for patients with bilateral ACL-deficient knees.

The incidence of bilaterality for ACL ruptures is reported to be between 2 and 4%^{1,14}. In spite

TABLE 1. Relation between age and time of second injury.

Age	Time between the two injuries (months)	Mean time gap
<30	24	24
30–35	18, 9, 12, 12, 16	13.4
>35	8	8

TABLE 2. Return to work, sports, scores.

Time gap (months)	Number	Return to work (weeks)	Return to sports (months)	Lysholm	IKDC
6–12	4	8.5	9.75	92	77.7
12–18	2	6	9	94.25	79.31
>18	1	6	8	94.5	81.58

TABLE 3. Age based return to work/sports, scores.

Age	Number	Return to work (weeks)	Return to sports (months)	Lysholm	IKDC
<30	1	6	8	94.5	81.58
30–35	5	7.2	9.4	93.3	78.83
>35	1	10	10	92	75.29



FIGURE 6. The younger age group was found to return to physical activities (work and sports) earlier.

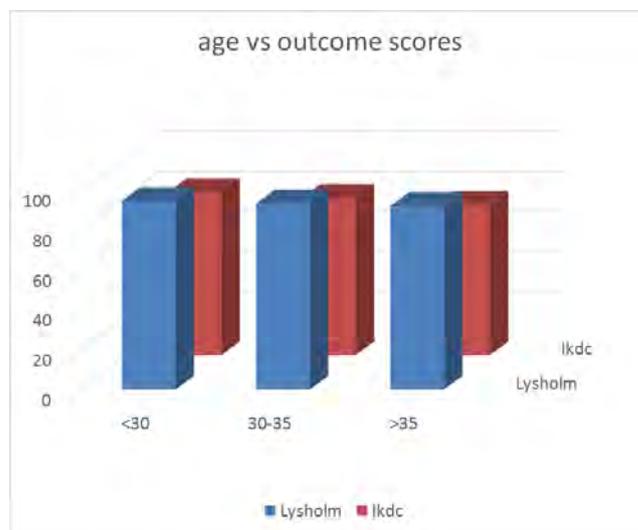


FIGURE 7. The Lysholm and IKDC scores were better for younger age group.

of reports on simultaneous bilateral ACL ruptures in the literature^{11,16}, the vast majority of patients presenting with bilateral ACL-deficient knees sustain non-simultaneous bilateral ruptures¹⁴. The short term follow up shows good outcome for single stage bilateral ACL reconstruction. These results indicate that there might be an advantage to performing simultaneous ACL reconstructions to stage procedures, which would involve two operations and rehabilitation programmes. Post operative hospital stay for the patients were on an average 3 days.

The main limitation of our study is the small number of patients who underwent one-stage bilateral ACL reconstruction. Low incidence of bilaterality for ACL ruptures is the reason why we did not present

more patients. In order to obtain more reliable results, a multicentre study should be made in the future. The results of our study indicate that there might be an advantage to performing one-stage bilateral ACL reconstruction as opposed to staged procedures, which would involve two operations and two rehabilitation programmes. Economic aspects play a significant role in health care delivery. In addition to lower costs, only one period of work-leave and one period of rehabilitation are needed, which results in less disruption to the lives of the patients and caregivers.

CONCLUSION

One-stage bilateral ACL reconstruction with hamstring tendon autograft is clinically effective. Based on this small series, there is no evidence that simultaneous bilateral ACL reconstruction is associated with any increased complication risks. For patients presenting with symptomatic bilateral ACL-deficient knees, one-stage bilateral ACL reconstruction is reproducible, cost effective and does not compromise functional results.

REFERENCES

1. Anderson AF, Lipscomb AB, Liudah KJ *et al.* (1987) Analysis of the intercondylar notch by computed tomography. *Am J Sports Med* 15:547–552.
2. Daniel DM, Malcolm LL, Losse G *et al.* (1985) Instrumented measurement of anterior laxity of the knee. *J Bone Joint Surg Am* 67:720–726.
3. Flynn RK, Pedersen CL, Birmingham TB *et al.* (2005) The familial predisposition toward tearing the anterior cruciate ligament. A case control study. *Am J Sports Med* 33:23–28.
4. Griffin LY, Agel J, Albohm MJ, Arendt EA *et al.* (2000) Noncontact anterior cruciate ligament injuries: Risk factors and prevention strategies. *J Am Acad Orthop Surg* 8(3):141–150.
5. Harmon KG and Ireland ML (2000) Gender differences in noncontact anterior cruciate ligament injuries. *Clin Sports Med* 19:287–302.
6. Huston LJ, Greenfield ML, Wojtys EM, Griffin LY and Garrick JG (2000) Anterior cruciate ligament injuries in the female athlete: potential risk factors. *Clin Orthop Relat Res* 372:50–63.
7. Jari S and Shelbourne KD (2002) Simultaneous bilateral anterior cruciate ligament reconstruction. *Am J Sports Med* 30:891–895.
8. Larson CM, Fischer DA, Smith PJ and Boyd JL (2004) Bilateral anterior cruciate ligament reconstruction as a single procedure. Evaluation of cost and early functional results. *Am J Sports Med* 32(1):197–200.
9. Lephart SM, Kocher MS, Harner CD *et al.* (1993) Quadriceps strength and functional capacity after anterior cruciate ligament reconstruction. Patellar tendon autograft versus allograft. *Am J Sports Med* 21:738–743.
10. Ochard J, Seward H, McGiven J *et al.* (2001) Intrinsic and extrinsic risk factors for anterior cruciate ligament injury in Australian footballers. *Am J Sports Med* 29:196–200.
11. Sanchis-Alfonso V and Tinto-Pederol M (2000) Simultaneous bilateral anterior cruciate ligament tears in a female beginner skier. *Knee Surg Sports Traumatol* 8(4):241–243.
12. Shelbourne KD and Gray T (1997) Anterior cruciate ligament reconstruction with autogenous patellar tendon graft followed by accelerated rehabilitation. A two-to nine-year follow-up. *Am J Sports Med* 25:786–795.
13. Sonnery-Cottet B, Archbold P, Cucurulo T, Fayard MJ *et al.* (2011) The influence of the tibial slope and size of the intercondylar notch on rupture of the anterior cruciate ligament. *J Bone Joint Surg* 93-B:1475–1478.
14. Souryal TO, Moore HA and Evans JP (1988) Bilaterality in anterior cruciate ligament injuries: associated intercondylar notch stenosis. *Am J Sports Med* 16(5):449–454.
15. Tegner Y and Lysholm J (1985) Rating systems in the evaluation of the knee ligament injuries. *Clin Orthop Relat Res* 198:43–49.
16. Tifford CD and Jackson DW (2001) Simultaneous bilateral anterior cruciate ligament ruptures in a cheerleader. *Arthroscopy* 17(4):E17.